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AUTHORITY

OACS D/A ltr, 13 Sep 1973

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO 96243

AVIB-LED 24 March 1967

SUBJECT: Final Report of Field Demonstration - Junglebuoy Radio Relay Repeater (ACL-36/67)

TO: Commanding General
United States Army, Vietnam
ATTN: AVHGC
APO 96307

1. REFERENCES

a. Letter, ACTIV to CG, USAECOM, 20 Sep 65, subject: Request for Antenna Information.

b. USAMC Message 36527 (AMCRD-DE) to Chief, ACTIV, 3 Jun 66, subject: Materiel Developed for Tactical Radio Communications.

c. USAECOM Message (AMSEL-NL-E-8-8-43), 18 Aug 66, subject: Materiel Developed for Tactical Radio Communications.

d. Technical manual for the Junglebuoy "I" Model Linear Radio Relay Repeater, Litton Systems Inc, undated.

2. PURPOSE

The purpose of this field demonstration was to determine the suitability of Junglebuoy as a means to extend the range of tactical communications in Vietnam.

3. BACKGROUND

Jungle vegetation radio propagation attenuation is a major communications problem in Vietnam. In an effort to improve jungle communications, the Army Concept Team in Vietnam (ACTIV) requested the US Army Electronics Command (USAECOM), to provide the status of those projects which could improve the transmission capability of the tactical radio sets in use in Vietnam (reference 1a). By indorsement and also by USAMC message (reference 1b) ACTIV was advised that recent developments were

expected to provide an improved jungle communications capability. Junglebuoy was identified as one of the developments. Shipping information, hardware quantities, and support requirements were provided by USAECOM (reference 1c).

4. OBJECTIVES

a. Objective 1 - Emplacement

Determine if the Junglebuoy can be effectively emplaced in the Vietnam environment.

b. Objective 2 - Range Extension

Determine typical values for communication range extension using various tactical radios and Junglebuoy emplacements.

c. Objective 3 - Procedures

Determine the effect of Junglebuoy characteristics on communication procedures and policies.

d. Objective 4 - Performance

Compare the performance of Junglebuoy with other means of communication range extension, and determine the circumstances which enhance or detract from employment of Junglebuoy.

5. DISCUSSION

a. General

(1) Environment

This field demonstration was conducted in two areas representative of the geographic environment of South Vietnam. One area, east and northeast of Saigon, had a wide variation in topography and vegetation. The other area, north and northwest of Saigon, was essentially flat with both jungle and open areas.

(2) Military Elements

The 173rd Airborne Brigade employed Junglebuoy in their area of operations east and northeast of Saigon. This unit relied heavily

upon tactical FM radios in their operations and provided an extensive test environment.

The 25th Infantry Division employed Junglebuoy in their area of operations north and northwest of Saigon.

(3) Data Collection

A question sheet, prepared by ACTIV, was the primary data collection vehicle. Direct questions in areas of significant importance were augmented by general questions designed to solicit user comments. The questionnaires were completed by personnel most directly concerned with tactical communications, i.e., unit commanders, communications personnel, and signal officers as appropriate. Quantitative data were collected when it did not interfere with unit primary missions.

(4) Limitations and Variables

The current combat environment limited the amount and quality of quantitative data that could be collected because unit operational requirements took precedence over the data collection effort. The physical environment varied with unit mission. This variation would have been significant if absolute or quantitative data were the primary objective. However, qualitative data, especially comparative data, were not significantly affected. The background of personnel using the test items varied with the tactical situation. This was an advantage because it provided a broader base of opinion.

b. Description of Materiel

Junglebuoy is a portable linear very high frequency (VHF) frequency modulated (FM) radio relay repeater designed to be deployed from aircraft or to be manually emplaced in the field. It is designed to frequency translate and amplify any signal received on the special receive frequency, and retransmit on another frequency. After deployment, Junglebuoy maintains radio silence until an input signal triggers it into activity, and it becomes silent again after the transmission is complete.

Junglebuoy consists of a canister (main body) assembly which contains electronic sub-assemblies and batteries, a mast assembly with airfoil blades to control the rate of descent when deployed from aircraft, an antenna assembly located on the upper end of the mast, and a spike located on the lower end of the canister for holding the unit erect when embedded in earth. The airfoil blades may be folded downward to the canister.

General specifications are (reference 1d):

1) Length:	canister, mast and spike	63½ inches
	antenna	22½ inches
2) Diameter:	canister	2½ inches
	blade circle	74 inches
3) Weight:	total	13.1 pounds
4) Rate of descent:		30 feet per second
5) Battery:		rechargeable nickel-cadmium
6) Operating life:		continuous - 2 hours; 10/sec/5 min-duty cycle - 40 hours; passive - 100 hours
7) Power output:		6 watts

c. Emplacement

To determine whether Junglebuoy could be effectively emplaced in the Vietnam environment, the following factors were evaluated: accuracy of air emplacement, proper polarization when emplaced, survivability, ease of deployment from aircraft, and ease of manual (surface) emplacement.

Accuracy of air emplacement was evaluated by deploying Junglebuoy from a UH-1 Iroquois helicopter flying at altitudes of 500 and 1000 feet (absolute altitude), at indicated airspeeds of 60 and 80 knots. Seven drops were made with the helicopter flying into the wind. The helicopter crews were not specially trained for these accuracy tests, nor did they have "warm-up" drops. All emplacements were recorded relative to distance from a sandbag bulls-eye and azimuth from line of flight. The average miss distance from an altitude of 500 feet was 150 yards. The average miss distance from an altitude of 1000 feet was 300 yards.

Proper polarization of Junglebuoy was checked after each drop by observing if the ground prong penetrated the ground sufficiently to support Junglebuoy and if the antenna was essentially vertical. Of the seven

drops, six penetrated sufficiently to support the Junglebuoy. In five cases, the antenna position provided essentially vertical polarization.

Survivability was evaluated by performing a simple communication check through Junglebuoy after each drop. Three Junglebuoys were used during this test; of the three, one did not survive the first drop, and one survived five drops. The third Junglebuoy survived the only drop it made but the rotors were bent by obstructions. The results of the air drop, polarization, and survivability tests are tabulated in inclosure 1.

The ease of deployment from a helicopter was determined by interview and observation of the individual releasing the Junglebuoy. The methodology recommended by the manufacturer was used. No problems were encountered deploying Junglebuoy from a helicopter.

The ease of manual (ground) emplacement was determined by interview and observation of individuals carrying, assembling, and emplacing the Junglebuoy. No problems were encountered in manual (ground) emplacement but taping or tying the rotor blades in a stowed position facilitated handling.

The Junglebuoys available for test were not subjected to deployment in the jungle canopy because of the negative results of the air-drop tests, tactical considerations, and possible hazards to ground personnel passing through insecure areas. Noting the damage to the rotor blades in the tests discussed, it appears doubtful that Junglebuoy could be adequately supported in the jungle canopy.

d. Range Extension

To determine the capability of Junglebuoy to extend communication range, the following nets were established: AN/PRC-25 to AN/PRC-25; AN/VRC-12 to AN/VRC-12; AN/PRC-25 to AN/VRC-12; AN/PRC-25 to Junglebuoy to AN/PRC-25; AN/VRC-12 to Junglebuoy to AN/VRC-12; AN/PRC-25 to Junglebuoy to AN/VRC-12. Each net was operated in both directions, with Junglebuoy both ground-emplaced and elevated in a retrievable location.

In the relatively flat and open terrain of the 25th Division base area, it was found that between AN/PRC-25's, Junglebuoy decreased communication range from 11.2 miles to 7.2 miles, when both ground-emplaced and elevated 30 feet. Between AN/VRC-12's, Junglebuoy decreased communication range from over 16 miles (maximum tested) to 9.9 miles, when both ground-emplaced and elevated 30 feet. Between AN/PRC-25 and AN/VRC-12 radios, Junglebuoy decreased communication range from 13.7 miles to 7.2 miles,

when both ground-emplaced and elevated 30 feet. The communication ranges were repetitively determined using four properly aligned Junglebuoys.

In the rolling, moderately vegetated area of the 173rd Airborne Brigade, it was found that between AN/PRC-25's, Junglebuoy decreased communication range from 5 miles to 1 mile, when ground-emplaced, and increased communication ranges to 10 miles when elevated 25 feet. Between AN/VRC-12's, Junglebuoy decreased communication range from 25 miles to 14 miles when ground-emplaced, and increased range to 35 miles when elevated 25 feet. Between AN/PRC-25 and AN/VRC-12 radios, Junglebuoy decreased range from 10 miles to 2 miles when ground-emplaced, and increased range to 15 miles when elevated 25 feet.

e. Procedures

To determine the effect of Junglebuoy on the standard operating procedures of the tactical units, unit commanders, signal, and communications personnel were interviewed for comments on frequency allocations, concealment, frequency interference, battery life, and "confidence factor."

The requirement for two frequencies when using Junglebuoy was called a negative feature because of the already saturated VHF-FM frequency spectrum in Vietnam. Also, since the Junglebuoy frequencies were pre-set, use of these frequencies would indicate to an enemy that an unusual operation, such as a long-range patrol, was in progress in a given area. Interference, jamming, and compromise require flexibility in frequency selection and Junglebuoy did not offer this capability.

The "one-way" mode of operation of Junglebuoy was found to be inconvenient. Junglebuoy receives on frequency A and transmits on frequency B. Station 1 necessarily transmits on frequency A and station 2 necessarily receives on frequency B. When station 2 desires to communicate back to station 1, the operator must retune his transmitter to frequency A; station 1 must retune to frequency B. The only options to continual retuning are emplacement of two Junglebuoys (one receiving A, transmitting B, the other receiving B, transmitting A), or using two transceivers at each station. Since both alternatives are impractical, Junglebuoy could be used conveniently only if one station could receive on frequency B and transmit directly to the other station (bypassing Junglebuoy) on frequency A.

Unit commanders were of the opinion that Junglebuoy should have a command destruct feature, or an explosive that would detonate if if the equipment were tampered with by enemy personnel.

Unit commanders were hesitant to consider Junglebuoy for preplanned communications because there was no assurance that it could be properly emplaced or that the required communication range extension could be achieved. The Junglebuoy transmitter will not "break" the squelch of the newer AN/PRC-25, AN/VRC-12 radios and these radios would have to be operated "squelch off."

f. Comparative Performance

To compare performance of Junglebuoy with other means of range extension, unit commanders, signal, and communications personnel were interviewed for their preferences. All personnel interviewed were given a thorough orientation and demonstration of Junglebuoy prior to the interview.

All personnel interviewed preferred the use of any other means of range extension (airborne relay, more powerful radios, antenna RC-292) to Junglebuoy.

6. FINDINGS

a. Junglebuoy cannot be effectively emplaced from helicopters because of inaccuracy and the high probability of damage.

b. Junglebuoy provides a token increase in the range of tactical communications under certain ideal situations.

c. Junglebuoy adversely affects communications procedures and policies by requiring two frequencies, by an inherent "one-way" limitation, and by absence of a command or self-destruct feature.

d. Personnel interviewed felt that Junglebuoy did not compare favorably with other means of communication range extension.

7. CONCLUSION

Junglebuoy, in its present configuration, is not suitable as a means to extend the range of tactical communication in Vietnam.

8. RECOMMENDATION

It is recommended that no further developmental action be taken on Junglebuoy.

Alton L Wood, Jr
COL Acting Deputy
for

2 Inclosures
1 Tabulation
2 Distribution

WILLIAM G. SULLIVAN
Colonel, Infantry
Commanding

TABULATION OF AIR DROP EXPERIENCE

Run No.	Abs Alt	LAS	WS WD	Item No.	Miss Dist & Azimuth	Penetration Yes/No	Vertical Yes/No	Survived Yes/No
1	500	60K	5K 120°	5	50 YDS @ 90°	YES	YES	YES
2	500	60K	5K 120°	6	75 YDS @ 210°	YES	YES	YES
3	500	60K	C	6	125 YDS @ 210°	YES	YES	YES
4	500	60K	C	6	250 YDS @ 180°	YES	YES	YES
5	500	80K	C	6	200 YDS @ 40°	YES	YES	YES
6	500	80K	C	6	200 YDS @ 100°	NO	NO	NO
7	1000	60K	C	3	300 YDS @ 100°	YES	NO	NO

DETAILS OF DAMAGE:

Run No. 1 - bottom spike loosened, fiberglass antenna base cracked, one large rotor blade bent, three large rotor blades pulled loose at base rivet.

Run No. 6 - fiberglass antenna base broken, one small rotor blade bent, two large rotor blades bent, three large rotor blades pulled loose at base rivet, bottom spike broken off.

Run No. 7 - Top antenna section broken off, bottom spike broken off, one small rotor blade bent and pulled loose at base rivet, two large rotor blades bent, three large rotor blades pulled loose at base rivet.

Inclosure 1